Winchester Math Curriculum Grade 4

Subject	Mathematics
Grade/Course	Grade Four
Unit of Study	Unit 3: Fractions and Decimals
Pacing	November / December
Unit Summary	In this unit, students work with a variety of tools, including folded paper strips, egg cartons, geoboards, number lines, and base ten pieces, to model, read, write, compare, order, compose, and decompose fractions and decimals. Their investigations and explorations range from the purely mathematical - the relationship between fifths and decimals, for example - to applied, as they determine a strategy to figure out how many candy bars the fourth grade teacher will have to buy if she plans to give an undefined number of students three-quarters of a bar each.

Overarching Mathematical Practices

4.MP.1 Make sense and persevere in solving problems.
4.MP.2 Reason abstractly and quantitatively.
4.MP.3 Construct viable arguments and critique the reasoning of others.
4.MP.4 Model with mathematics.
4.MP.5 Use appropriate tools strategically.
4.MP.6 Attend to precision.
4.MP.7 Look for and make use of structure.
4.MP.8 Look for and express regularity in repeated reasoning.

Unit CT Core Content Standards

Note: Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

4.NF.A.1
Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

4.NF.A.2
Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

4.NF.B.3
Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.

4.NF.B.3.A

Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

4.NF.B.3.B
Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

4.NF.B.3.C
Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

4.NF.B.3.D
Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

4.NF.B.4.A
Understand a fraction *a*/*b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

4.NF.C.5
Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.

4.NF.C.6
Use decimal notation for fractions with denominators 10 or 100.

4.NF.C.7
Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

"Unwrapped" Standards	
Skills	**Content**
Explain	why a fraction a/b is equivalent to a fraction (n x a)/(n x b)
Use	● visual fraction models ● properties of operations and the relationship between addition and subtract to add or subtract mixed numbers ● equations to represent word problems ● decimal notation
Attend	to how the number and size of the parts differ even though the two fraction are same size
Generate	equivalent fractions
Compare	● two fractions with different numerators and different denominators

	● fractions to benchmark fractions ● two decimals to the hundredths
Create	common denominators or numerators
Recognize	● comparisons are only valid when fractions or decimals refer to the same whole
Record	● results of comparisons with symbols >, =, < ● decomposition of a number by an equation
Justify	● conclusions ● decompositions
Understand	● a fraction *a/b* with *a* > 1 as a sum of fractions *1/b* (unit fraction) ● addition and subtraction of fractions as joining and separating parts referring to the same whole ● a fraction a/b as a multiple of 1/b (unit fraction)
Decompose	a fraction into a sum of fractions with the same denominator in more than one way
Add and subtract	mixed numbers with like denominators
Replace	mixed numbers with equivalent fractions
Solve	● word problems involving addition and subtraction of fractions with like denominators ● word problems involving multiplication of a fraction by a whole number
Express	a fraction with denominator 10 as an equivalent fraction with denominator 100 and use to add two fractions with the respective denominators

Essential Questions	Big Ideas
1. What is a fraction?	1. A fraction is a number that represents how many parts of a whole. It is also a division relationship between two numerical values.
2. How can fractions and decimals be modeled, compared, and ordered?	2. All numbers can be expressed, ordered and compared by mathematical principles, properties, and/or modeled with physical tools and number lines.
3. What do fractions and decimals represent?	3. Fractions and decimals represent a relationship between two numbers that represent a whole and part(s) of the whole.

Evidence of Learning - Assessment

	Interim Assessment	Additional Evidence of Learning
Unit 3 Pre-Assessment - Module 1, Session 1	● Equivalent Fractions Checkpoint - M2, S1	Options ● Exit tickets ●

Unit 3 Post-Assessment - Module 4, Session 4	● Fraction and Decimal Checkpoint - M3, S4	Observational Assessments ● Dozens of Eggs - M2, S4 ● Racing Fractions - M2, S6 ● Decimal Four Spins to Win - M3, S3 ● Decimal More or Less - M3, S4 ● Fractions and Decimals M4, S2

Smarter Balanced Interim Assessment

Smarter Balanced General Scoring Rubrics - 4 Rubrics included - Score Pt 4 to Score Pt 1

· **Smarter Balanced Interim Blocks**

· Interim assessment blocks may be used for a variety of assessment purposes, including: pre/post, interim and formative (additional evidence of learning).

· The Style Guide, which aligns with the expectations of Smarter Balanced Assessments, will support the creation of unit- and standard-aligned items for instructional use.

· The items on the interim assessments are developed under the same conditions, protocols, and review procedures as those used in the summative assessments. Therefore, they assess the same Common Core State Standards, adhere to the same principles of Universal Design in order to be accessible to all students, and provide evidence to support Smarter Balanced claims in mathematics and ELA/literacy. The interim assessment items are non-secure but non-public. This means that educators may view the items, however, they should not be made public outside of classroom, school or district.

· **Unit-aligned Smarter Balanced Interim Assessment Block (IAB)*:**

Interim Assessment Block - access through CSDE Assessment Portal

- IAB - N/A

· **Some interim blocks show clear, strong alignment to priority standards within the unit. Other blocks have been placed in one specific unit but could be aligned to the priority standards of several units. Blocks have been spread out over the course of all units for a more balanced approach to assessment throughout the school year. These interim blocks, used in partnership with the Style Guide, will support the creation of unit- and standard-aligned items for instructional use.*

Learning Plan

Researched-based Instructional Resources and Methods

Sequence of Instruction:
Number Corner → Problem + Investigations →Work Places → Math Forum*→Daily Practice or Home Connection

Bridges Number Corner - The focus areas of Number Corner Aligned to Unit 3 are:
Time

- Relative size of seconds, minutes, and hours

- Elapsed time
- Identify features of a pattern related to time and elapsed time
- Solve problems involving elapsed time

Measurement
- Cups
- Quarts
- Gallons
- Conversion from cups to gallons and vice versa
- Making multiplicative comparisons
- Solve story problems involving liquid measurement and simple fractions - halves, fourths, sixteenths

Computation
- Compare multi-digit whole numbers
- Add multiples of 5 and 10 on a number line
- Discussion on how knowing how to multiply by 5 and 10 can help multiply with other numbers

Multi-Digit Addition Strategies
- Decomposing addends
- Applying associative property
- Standard Algorithm

Place Value
- Round numbers
- Compare numbers
- Apply place value understanding to solve challenging story problems including estimation
- Determine when it is useful and appropriate to estimate

Bridges - Whole Group, Small Group and Independent Problem Centered Activities

Module 1	Module 2	Module 3	Module 4
Problem + Investigation ● Sessions 2-6 Problem String ● None Work Place ● Session 1 Math Forum ● None Daily Practice ● Sessions 1-6 Home Connection ● Sessions 2, 4, 6	Problem + Investigation ● Sessions 1-6 Problem String ● None Work Place ● Sessions 4, 5 Math Forum ● None Daily Practice ● Sessions 1-6 Home Connection ● Sessions 2, 4	Problem + Investigation ● Sessions 1-3 Problem String ● None Work Place ● Sessions 3, 4 Math Forum ● None Daily Practice ● Sessions 1-4 Home Connection ● Sessions 2, 4	Problem + Investigation ● Sessions 1,3 Problem String ● None Work Place ● Sessions 1-4 Math Forum ● None Daily Practice ● Sessions 1-4 Home Connection ● Sessions 2, 3

Possible Misconceptions	**Teacher Moves**
1. Students who use addition instead of multiplication to develop sets of equivalent fractions.	1. The students need additional experiences with visual representations including fraction bars, area models, and the number

	line.
2. Explanations of why one multiples or divides to find an equivalent fraction.	2. These explanations should begin with visual representations and eventually connect to the rule/algorithm. (If I triple the number of pieces in the whole, that triples the number of pieces in my count).
3. It is important for students to use reasoning and number sense to compare fractions and justify their thinking. Students who forget that the larger the number in the denominator, the smaller the piece, may base their comparisons on incorrect notions.	3. These students need additional practice with concrete models and making connections with written numerals.
4. When comparing fractions, students must consider the size of the whole. One-half of a large box of popcorn is greater than ½ of a small box of popcorn.	4. Take time to provide a variety of experiences for students to make sense of these important concepts.
5. Students may struggle with identifying a situation as an addition or subtraction situation. (Students need not actually add or subtract fractions at this point, although many of them will be ready.)	5. Provide more experience solving problems that require addition and subtraction. Modeling such situations using fraction pieces will help them to relate these operations to previous work with whole numbers.
6. Decomposition of fractions and the justification of the decompositions may be obvious to some students.	6. Even if this work is obvious to some, it is important to take the time to build this concept because it lays the foundation for adding and subtracting fractions. Students who see fractions as composed of smaller parts develop the understanding that when they add or subtract fractions, the numerator describes the count of pieces and the denominator describes the piece. Carefully developing this concept now will avoid misconceptions many students have when adding two fractions with unlike denominators.
7. Remember at this point students are not expected to develop an algorithm for adding fractions with unlike denominators.	7. This is an important opportunity for students to think about and explore situations in which adding two fractions with unlike denominators necessitates finding a common denominator and why.
8. Students who add numerators and denominators.	8. They need more explicit experiences with models and to talk about why the denominator needs to be the same. Experiences should also focus on why they do not add denominators when adding fractions. Reinforcing the meaning of the numerator as the count of the number of pieces and the denominator as a descriptor telling the number of pieces in the whole supports future experiences adding fractions with unlike denominators in grade 5.

Vocabulary and Representations

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary
area* compare/comparison convert difference* divide* division* equal* equivalent* pattern* product* region relationship share/shares unit value whole *Smarter Balanced Vocabulary is focused on major mathematical concepts. (Not all possible words have been identified by SBAC) + Students are not responsible for these vocabulary words at this grade level, however they should have some understanding of the mathematical concept.	decimal decimal number decimal point denominator* eighths equation* equivalent fraction* fifths fourths fraction* hundredth* improper fraction numerator* mixed number* quotient* ratio table (table of equivalent ratios) sixteenths sixths tenth* thirds twelfths

Mathematics Teaching Practice Resources

1. **Bridges** - Reference Math Practices in Action Notes - The notes identify how particular mathematical practice is employed in a specific activity.
    a. additional resources will be able to be linked with the purchase of Bridges.
2. **Math Practices Teacher Question Starters**
3. **Implementing the Standards of Mathematics Practice**
4. Illustrating the Standards of Mathematical Practice
5. Math Practice Standards Posters Gr. 4-5
6. Grade 4 - Standards + Practices - Explanations and Examples
7. Number Talks Matter - Number Talks at a Glance and Fluency without Fear
8. **Use and Connect Mathematical Representations**
9. **Pose Purposeful Questions**
10. Journal Prompts for Math
11. Bridges Interactive Math Manipulatives
12. Mistakes are Powerful - Resource to develop students' perseverance through mistakes
13. Benchmark Fraction Information
14. Connecting Decimals and Fractions
15. Equivalent Fraction Information
16. Fraction Quick Images
17. Accountable Talk Moves

18. Contribution Checklist
19. Sentence Frames that Can Build Metacognitive Thinking
20. Sample Language Frames for Mathematics
21. Building a Mathematical Mindset Community
22. Illustrative Math – Grade 4
23. Learn Zillion
    a. Recognize equivalent fractions using area models
    b. Recognize equivalent fractions using number lines
    c. Make equivalent fractions using multiplication
    d. Insect Olympics: Add and subtract fractions in word problems
24. K-5 Math Resources
    a. Who Ate More?
    b. Adding Like Fractions
    c. Subtracting Like Fractions
    d. Fractions and Decimals

Suggestions for Differentiation, Scaffolding and Intervention

Differentiation or Intervention

Any teacher moves/strategies that address misconceptions can be used in differentiation or as intervention.

Math Teaching Practice Resources contain resources that provide opportunities for differentiation, intervention, or extension aligned to the strategies below.

- How to Select Math Intervention Content
- Coherence Map in Math – The coherence map shows how standards within and across grades build upon each other. You can use the map to assist you in to build student understanding by linking together concepts within and across grades and identify gaps in a student's knowledge by tracing a standard back through its logical prerequisites.
- CT Dept. of Education Evidence-based Practice Guides – These guides provide links to "evidence-based activities, strategies and interventions (collectively referred to as 'interventions')."
- Evidenced-based strategies for supporting struggling students (U.S. Dept. of Education – What Works Clearinghouse)
- Ensure instructional materials are systematic and explicit. In particular, they should include numerous clear models of easy and difficult problems, with accompanying teacher think alouds.
- Provide students with opportunities to solve problems in a group and communicate problem-solving strategies.
- Teach students about the structures of various problem types, how to categorize problems based on structure, and how to determine appropriate solutions for each problem type.
- Students should work with visual representations of mathematical ideas.
- If visual representations are not sufficient for developing accurate abstract thought and answers, use concrete manipulative first. (Include the next line for middle school and older students only) Although this can also be done with students in upper elementary and middle school grades, use of manipulatives with older students should be expeditious because the goal is to move toward understanding of and facility with visual representations and finally to the abstract.

- Provide carefully constructed questions to help direct students in determining what to do to solve problems, but they shouldn't be told how to reach the solution.
- Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.

Intervention for facts

- Provide about 10 minutes per session of instruction to build quick retrieval of basic arithmetic facts. Consider using technology, flashcards, and other materials for extensive practice to facilitate automatic retrieval.
- For students in K -2 explicitly teach strategies for efficient counting to improve the retrieval of mathematics facts.
- Teach students in grade 2-8 how to use their knowledge of properties, such as commutative, associative, and distributive to derive facts in their heads.
- How to Promote Acquisition of Math Facts – Intervention for struggling students
- National Center on Intensive Intervention - Basic Facts
- Once a strategy has been taught, it is important to reinforce it. The reinforcement or practice exercises should be varied in type and focus as much on the discussion of how students obtained their answers as on the answers themselves.
- Having students work in groups (as opposed to handing your bright students a workbook to work on when the classroom material isn't challenging enough) with other children ready for advanced material shows them that mathematics is not a solitary discipline -- mathematics is exciting and vibrant and creative and fun.
- Struggles with basic facts - need more experience with concrete and pictorial representations, including describing what their models represent to make connection to basic facts. Time and experience with developing strategies that are based on patterns and properties will help support learning the facts. It is important to give students time to learn and understand these concepts before procedural skill practice takes place.
- Concrete, Representational, Abstract Progression

Strategies to support EL students:

- Colorin Colorado – A Bilingual site for educators and families of English learners
- Stanford University - Principles for Mathematics Instruction of ELs
- CT State Dept. Of Education English Learner Standards and Resources
- Nonverbal responses, such as thumbs up, will help you check for understanding without requiring students to produce language. ELLs can participate and show that they understand a concept, or agree or disagree with an idea, without having to talk. This is especially important for students whose comprehension of English is more advanced than their ability to speak the language.
- Pre-teach vocabulary in ways that connect to students' prior knowledge.
- Display posters of graphic representations of vocabulary words.
- http://www.cal.org/siop/lesson-plans/
- Provide support to assist in explaining thinking with sentence starters and work banks.
- Use Work Place Sentence Frames or other sentence frames to assist students in math discourse.
- Speak slowly and use clear articulation. Reduce the amount of teacher talk and use a variety of words for the same idea. Exaggerate intonation and place more stress on important new

concepts or questions. After asking a question, wait for a few moments before calling on a volunteer. Writing the question on the board will also help.
- English language learners are not always able to answer the questions posed to them, especially when the questions are open-ended. Provide support for and improve the participation of students with lower levels of English proficiency by using a prompt that requires a physical response, like "Show me a half, a third, etc.." or "Touch the larger number."
- Increase academic language knowledge for English learner success.

Extension
- Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.
- Give children collections of fractional parts which are all the same type (fifths, eighths, etc.) and tell them the size of their pieces. Their task is to decide if each individual collections is less than one whole, one whole or more than one whole. They can also attempt to determine the actual fraction number that represents their collection. Those that represent more than one can be expressed as an improper fraction or mixed number.

Interdisciplinary Connections

Children's Literature * Bridges recommended titles - # Titles embedded in Bridges Units

*_Tuesday_ by David Wiesner
* _All in a Day_ by Mitsumasa Anno
*_Anno's Sundial_ by Mitsumasa Anno
*_Clocks and More Clocks_ by Pat Hutchins
*_Bats Around the Clock_ by Kathi Appelt
*_Gator Pie_ by Louise Matthews
*Sir Cumference and the Fraction Faire by Cindy Neuschwander
*_Fractions in Disguise_ by Edward Einhorn
*Fraction Action by Loreen Leedy

Science

Use evidence (e.g., measurements, observations, patterns) to construct explanations.

Music

Analyze notational elements related to fractions

ELA

LACCSS.ELA-LITERACY.SL.4.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.4.1.A

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

CCSS.ELA-LITERACY.SL.4.1.B

Follow agreed-upon rules for discussions and carry out assigned roles.

CCSS.ELA-LITERACY.SL.4.1.C

Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.

CCSS.ELA-LITERACY.SL.4.1.D

Review the key ideas expressed and explain their own ideas and understanding in light of the discussion